magnetization, of smaller than 4.5 nanometer Tesla.

In the present invention, the nonmagnetic high-conductivity layer may be of a metal film that contains at least one metal element selected from the group consisting of copper (Cu), gold (Au), silver (Ag), ruthenium (Ru), iridium (Ir), rhenium (Re), rhodium (Rh), platinum (Pt), palladium (Pd), aluminium (Al), osmium (Os) and nickel (Ni), all of which are advantageous for meeting the condition of realizing low Hin.

In the present invention, the nonmagnetic high-conductivity layer may have a laminate film composed of at least two layers, for attaining low Hin and soft magnetic characteristics control. In the present invention, in the laminate film, the layer adjacent to the first ferromagnetic layer may contain copper (Cu) which is especially suitable for realizing high MR ratio, low Hcu and soft magnetic characteristics. In the laminate film, the layer not adjacent to the first ferromagnetic layer may contain at least one element selected from the group consisting of ruthenium (Ru), rhenium (Re), rhodium (Rh), palladium (Pd), platinum (Pt), iridium (Ir) and osmium (Os) all of which are especially suitable for realizing low Hin, low Hcu and soft magnetic characteristics control.

In the present invention, the nonmagnetic high-conductivity layer may have a thickness of from 0.5 nanometers to 5 nanometers and the element may realize low Hcu and high

MR ratio.

In the present invention, the layer that is contacted with the nonmagnetic high-conductivity layer at the plane opposite to the plane at which the nonmagnetic high-conductivity layer is contacted with the first ferromagnetic layer may contain at least one element selected from the group consisting of tantalum (Ta), titanium (Ti), zirconium (Zr), tungsten (W), hafnium (Hf), molybdenum (Mo), and chromium (Cr), and the device may realize low Hin and high MR ratio.

In the present invention, the first ferromagnetic layer may be of a laminate film that comprises an alloy layer containing nickel iron (NiFe) and a layer containing cobalt (Co) and the device may realize high MR ratio and soft magnetic characteristics.

In the present invention, the first ferromagnetic layer may be an alloy layer containing cobalt iron (CoFe) and the element may realize high MR ratio and soft magnetic characteristics.

In the present invention, for pinning the magnetization direction of the second ferromagnetic layer, an antiferromagnetic layer may be laminated over the layer.

In the present invention, for realizing still high MR ratio even after thermal treatment in its production, the antiferromagnetic layer may be made of a material, XzMn1-z in which X indicates at least one element selected from the group

consisting of iridium (Ir), ruthenium (Ru), rhodium (Rh), platinum (Pt), palladium (Pd) and rhenium (Re) and the compositional factor z falls between 5 atm.% and 40 atm.%, in the present invention.

In the present invention, the antiferromagnetic layer may be made of a material, $X_zMn_{1-z}$ in which X indicates at least one element selected from the group consisting of platinum (Pt) and palladium (Pd) and the compositional factor z falls between 40 atm.% and 65 atm.%, and the element may maintain high MR ratio.

In the present invention, the nonmagnetic spacer may be of a metal layer containing copper (Cu) and its thickness may be between 1.5 nanometers and 2.5 nanometers and the element may realize high MR ratio for more efficiently utilizing the effect of high MR ratio by the nonmagnetic high-conductivity layer, and may also realize low Hcu.

In the present invention, the pair of ferromagnetic films as antiferromagnetically coupled to each other may have the same thickness and the difference in the magnetic thickness, thickness × saturation magnetization, between the pair of ferromagnetic films may fall between 0 nanometer Tesla and 3 nanometer Tesla, and the element may realize high MR, improved ESD resistance, and the thermal stability of the second ferromagnetic layer.

In the present invention, the antiferromagnetically